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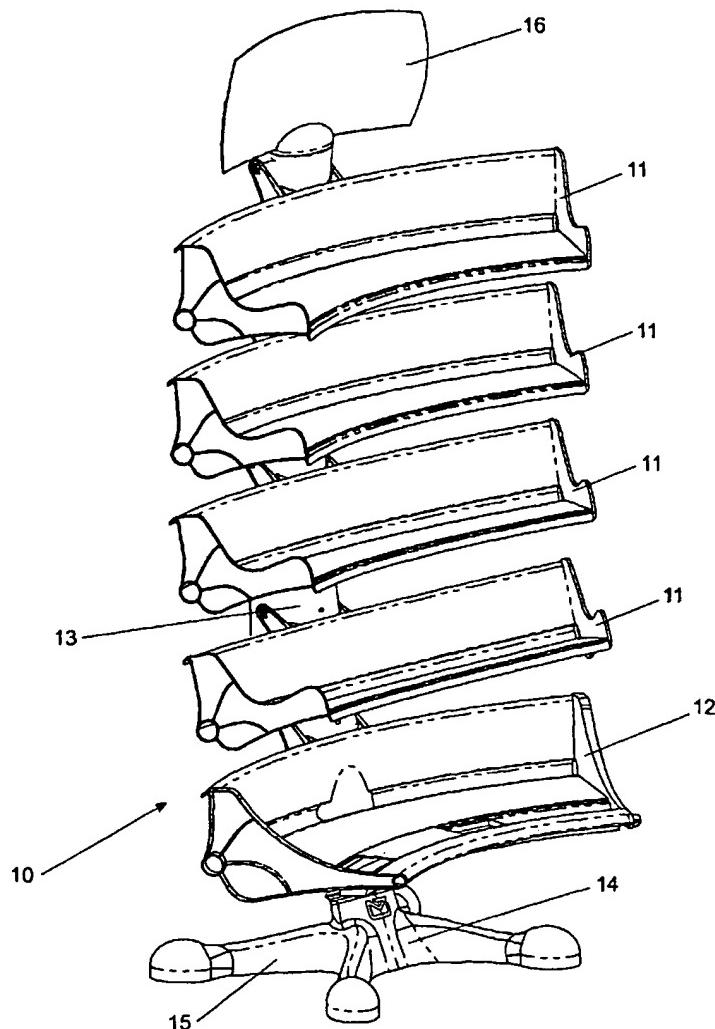
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[Continued on next page]

(54) Title: IMPROVEMENTS RELATING TO SORTING APPARATUS



(57) Abstract: This invention relates to a sorting apparatus (10) for sorting mail and the like. The apparatus (10) includes a curved rack (13) with a plurality of indents. A plurality of curved shelves (11, 12) can be installed at a desired position on the rack (13). To facilitate installation, each shelf (11, 12) includes a bracket (21) on the back with a cross bar which is adapted to locate on one of the indents (20) on the rack (13). A plurality of partitions (40) can be installed on each shelf (11, 12) to provide slots for placing mail. Each partition (40) can be lifted and moved to a desired position on a desired shelf (11, 12).

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

## IMPROVEMENTS RELATING TO SORTING APPARATUS

### FIELD OF THE INVENTION

This invention relates to manual sorting systems and particularly but not solely to apparatus for use when sorting articles such as letters and the like in a postal delivery service. The

5 apparatus is intended to be efficient and ergonomic so that a human operator is able to distribute mail items quickly by hand among a range of slots using natural movements.

### BACKGROUND TO THE INVENTION

10 Apparatus commonly referred to as a "stand" is available to assist manual mail sorting operations, as described in NZ patent specification 23409, US patent 5,590,794 and EP patent specification 635316, for example. Each stand generally consists of a framework having an array of boxes or shelves which are partitioned to form "slots" or bins into which the mail is sorted by criteria such as street address. The apparatus is also generally modular  
15 so that each stand can be expanded or a number of stands can be arranged together to increase the number of slots as required.

An operator using a sorting stand is presented with one or more planar arrays of slots into which large numbers of mail items must be individually placed. The slots may be arranged  
20 and labelled in various ways. Slots which represent house numbers along a street may be distributed horizontally along a shelf, for example. The streets within a district may be distributed vertically on respective shelves. Slots for some of the streets and some of the street numbers are therefore arranged further from the operator than others and may be more or less easy to identify and reach.

25  
SUMMARY OF THE INVENTION

It is an object of the present invention to provide sorting apparatus which is more efficient or easier to use than existing apparatus, or at least to provide an alternative to the existing  
30 apparatus. This object is generally achieved by providing a sorting stand having components which are curved in one or more directions about an approximately central position. Preferably the components include shelves which are curved in a horizontal plane and/or a support for the shelves which is curved in a vertical plane.

- In a first aspect the invention may broadly be said to consist in apparatus for use in sorting articles, comprising: an upright support having a base portion and a shelf holding portion, a plurality of shelves which are adjustable on the shelf holding portion to a range of heights above the ground and which have a substantially horizontal curvature away from the shelf holding portion and a plurality of partitions which are adjustable on the shelves to provide a range of slots for sorted articles. Preferably the shelves are adapted and may be positioned to provide substantially uniform curves when placed in conjunction with shelves on adjacent apparatus.
- 5
- 10 In a second aspect the invention may also be said to consist in apparatus for use in sorting articles, comprising: an upright support having a base portion and a shelf holding portion which has a substantially vertical curvature towards a potential user of the apparatus., a plurality of shelves which are adjustable on the shelf holding portion to a range of heights above ground, and a plurality of partitions which are adjustable on the shelves to provide a range of slots for sorted articles. Preferably the shelf holding portion of the support has 15 a centre of curvature located behind the user.
- 20
- The invention may further be said to consist in any alternative combination of features which are indicated in this specification. All equivalents of these features are to be included within the scope of the invention whether or not they are explicitly indicated.
- BRIEF OF DESCRIPTION OF DRAWINGS
- Preferred embodiments of the invention will be described with respect to the drawings by 25 way of example, of which:
- Figure 1 is a perspective view of a preferred embodiment sorting stand showing curved shelves,
- Figure 2 is a side view of the stand in Figure 1 showing a curved rack which supports the shelves,
- 30 Figures 3a, 3b, 3c show views of receiving and working shelves which may be used in the stand,
- Figures 4a, 4b, 4c are views of a partition which may be used with the receiving shelves,
- Figures 5a and 5b show side profiles of a partition installed on a shelf in a locked 35 position,

Figures 6a and 6b show side profiles of a partition installed on a shelf in a released position,

Figures 7a and 7b show perspective views of a tag engaged with the shelf in released and locked positions respectively,

5 Figure 8 shows a cross-section of the extruded rack,

Figure 9 shows a curved arrangement of three preferred embodiment stands in use,

Figure 10 is a plan view of the arrangement in Figure 6 indicating a user, and

Figure 11 is a side view of the arrangement in Figure 6 indicating the user.

## 10 DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Figure 1 shows a preferred embodiment sorting stand 10 having a curved configuration which assists distribution of mail items or other articles in manual sorting operations. The stand includes a set of four receiving shelves 11 and a working shelf 12 all mounted on a

15 rack or support 13. Mail items are sorted into slots formed on the receiving shelves by partitions which will be described below. A lower part of the rack is mounted in a base 14 which has four legs 15 for stability on the ground. A top part of the rack holds a panel 16 which may be used to display information related to the sorting process. Each of these components may take a range of different shapes and structures in accord with the invention.

20 Figure 2 shows the stand from one side and demonstrates curvature of the rack 13 in a vertical plane. This causes shelves toward the lower part of the rack to be inclined upwards by an increasing degree. The rack in this example is an upright uniformly curved column, typically of metal or plastic, having a series of indents 20 which are provided for adjustment of the shelves. Portions of the rack which do not hold shelves need not be curved. Each shelf has a bracket 21 which engages an indent when the shelf is mounted on the rack. Height adjustments are carried out by manually lifting and moving a shelf backwards to disengage the bracket from the indent. The shelf can then be raised or lowered to another height and positioned so that the bracket engages an indent and is held in place by the weight of the shelf. Shelves may be added or removed from the rack by detachment of their brackets. Various other ways of mounting and adjusting the shelves may also be provided. The rack 13 can optionally also include bellows on a lower portion which utilise an electromechanical mechanism to enable the entire stand 10 to be raised or

lowered as required. It should also be appreciated that the rack 13 can be of any suitable length to accomodate installation of any desired number of shelves.

- Figures 3a and 3c are views of a receiving shelf 11 and working shelf 12 respectively in  
5 Figure 1 demonstrating curvature in a horizontal plane. The shelves in this example have a floor 30, back wall 31, side walls 32, a front edge 33 with and elongated recess 50 (visible in Figures 5a and 5b) and an upper edge 34, typically of a plastics material. The floor of a working shelf is generally broader than that of a receiving shelf. The working shelf 12 may also include a duct tray 38a for rubber bands, paper clips and the like, a letter seal tray  
10 38b and one or more removable duct covers 38c. The side walls are generally perpendicular to the edges. Each shelf also preferably has a track 35 between the floor and the back wall into which dust or other waste material may be brushed. Apertures 36 in side walls 32 at each of the track enable the material to be removed for disposal. Ribs 39 strengthen the side walls. Figure 3b is a rear view of either shelf showing the bracket 21 with a cross bar  
15 adapted for engagement with a desired indent 20 on the rack. The bracket 21 can either be integrally formed with the back wall 31 of the shelf or alternatively can be a separate component adapted for attachment to the shelf. Various other features of the shelves such as label holders have not been shown.
- 20 Figures 4a, 4b and 4c show the general form of partitions 40 or dividers which may be used to form slots on the receiving shelves. Each partition in this example has a main portion 41 which is preferably of a transparent plastic material to assist inspection of items in the slots, and shaped with a convex edge 42 to assist placement and removal of items by hand. A target portion 43 may be coloured to assist identification of particular slots and textured  
25 to assist placement of the items. A hooked portion 44 is adapted to engage with a portion of the corresponding upper edge 34 of the receiving shelves. A locking tag 47 engages an underside 37 of the ceiling of the track 35 when the partition is located on a shelf. An operator is thereby able to fix the back edges 48 of a number of partitions 40 to the back 31 of the shelf and slide the partitions to create slots of any required width or position. A  
30 tab 46 or other receptacle is provided for a label such as a street number. Preferably the angle of the tab 46 in combination with the curvature of the rack 13 is such that when the shelf 11 or 12 is installed the label on the tab is displayed at an angle which is convenient for the operator to view. The tab 46 enables any label for the corresponding partition to move with the partition when it is relocated. This prevents the need for a relabelling process  
35 which is necessary when partitions are moved in systems in which the labels are affixed to

the shelves. A rebate portion 45 corresponds to track 35 of the shelves to assist removal of waste material.

Partitions with numerous other shapes and features may also be used. In a preferred  
5 embodiment the flexible nature of each partition 40 enables the length of the partition to be bent sideways, thus increasing the gap relative to an adjacent partition. This is useful for accomodating larger items or more items of mail without the need for changing the position of any partitions. This can be particularly convenient as changing the position of one partition often requires the positions of adjacent and nearby partitions to also be moved  
10 as a consequence. The front edge of each partition also preferably includes a flange 49 which optionally can be snap-locked into a portion of a corresponding elongated recess 50 along the front edge 33 of the shelf 11, 12. This fixes the front edge of the partition to the shelf to prevent sideways bending of the partition 40 as described above. Disengaging the flange 49 from the recess returns the front of the partition into a release mode which  
15 enables sideways flexing to take place.

Figures 5a-6b show in more detail the manner in which the partition can be installed in either a release mode or a locked mode. Figures 7a and 7b show perspective drawings of the front edge 33 of the shelf 11 with the flange 49 positioned in a release mode and a  
20 locked mode respectively. Figure 5a shows a profile of a partition 40 installed on a shelf 11 in a locked mode, with Figure 5b showing further detail of the front of the partition 40 engaged with the front edge 33 of the shelf 11. The flange 49 on the front of the partition 40 engages in the elongated recess 50 which runs along the front edge 33 of the shelf 11. The flange 49 snap-locks over a lip 51 into the recess 50. The size of the recess 50 and the  
25 resilient nature of the flange 49 and partition 40 are such that the front edge of the partition is fixed in place however can still be released again if required. Fixing the front end of the partition 40 to the shelf 11 limits flexing or bending of the partition.

Once in this position the base portion 51 of the flange 49 and the tab 46 rest on an L shaped  
30 protrusion 53 disposed on the front edge 33 of the shelf 11. The back edge 48 of the partition 40 can then be fixed in position by engaging the flexible hooked portion 44 over the correspondingly curved upper edge 34 of the shelf 11. The tag 47 is also engaged on the underside 37 of the ceiling portion of the rebate 35. The flexible nature of the tag 47 and hooked portion 44 retain the back edge in position. It should be noted that Figure 5a  
35 shows the hooked portion 44 and tag 47 prior to engagement with the shelf 11. Once

installed in this configuration the partition 40 can slide along the shelf, however the fixed front portion limits sideways bending of the partition.

Figures 6a and 6b show the partition installed in a release mode in which the flange 49 rests  
5 upon a ledge 60 which is formed in the profile of the front edge 33 of the shelf 11. The flange 49 may also abut against a vertical wall 61 adjacent to the ledge 60. In this configuration the flange 49 can slide across the ledge 60 such that the front portion of the partition 40 is free to move. The hooked portion 44 engages with a portion of the correspondingly curved upper edge 34 of the receiving shelves. Similarly the tab 47  
10 engages with the underside 37 of the ceiling portion of the rebate 35. The resilient nature of the hooked portion 44 and tab 47 provide enough biasing force to retain the back edge 48 of the partition 40 in place while still allowing the partition 40 to slide along the shelf if required. With the front portion of the partition 40 being free to move and the back edge  
15 of the partition 40 being fixed in place, the length of the partition 40 can be flexed sideways to provide more or less gap between the partition 40 and a neighbouring partition as required.

A cross section of the rack 13 of the preferred embodiment stand is shown in Figures 8a,  
8b and 8c. The rack 13 is preferably constructed as an aluminium extrusion, which is  
20 generally oval in shape and substantially hollow. The extrusion includes internal bracing portions 50 which provide overall strength and rigidity in the rack 13. The longer sides of the cross-section include dove tail recesses 81, 82 for receiving corresponding plastic inserts 83, 84. Each insert 83, 84 includes bracing portions 85, 86 respectively for strength and rigidity. The front plastic insert 84 can be used to display promotional or informational  
25 graphics as required. The rear plastic insert 83 is visible in Figure 8c and includes the multiple indents 20 for receiving a cross bar of a bracket 21 of an installed shelf 11, 12.

Figure 9 shows an arrangement of three stands with respective shelves and partitions in an idealised configuration. The shelves on each stand all preferably have a common curvature  
30 and common length. The racks are also preferably of a common curvature and common height. This enables the arrangement to be set up with rows of shelves having an alignment and continuity without intervening gaps. The number and position of the receiving shelves 11 and working shelves 12 may be varied to suit a particular operator and work at hand. Working shelves may be omitted, for example, or placed higher on each rack. It will also  
35 be appreciated the curved shelves might be used with relatively straight racks, or that

relatively straight shelves might be used with curved racks, although a combination of both aspects is generally more effective. In addition letter trays 90 may be fitted onto the base portions 14 as required.

5 Figures 10 and 11 are plan and side views showing an operator 100 at work in a sorting operation using the arrangement of Figure 9. A few assorted items are shown on the working shelves 12 but nothing currently in slots, eg 101, which are formed in the receiving shelves 11. The shelves form curved rows each having a respective centre of curvature which lies on a generally vertical line. Each preferably has a radius of curvature which is  
10 from two to four times the length of an arm of the operator, most preferably about three times the length of the arm. The racks are generally parallel and have centres of curvature which lie approximately at a common point. The operator is located at a central position approximately midway between the shelves and the line. The point generally lies behind and aligned with the line and the torso and shoulders of a typical operator. These  
15 characteristics are preferable but not essential. Other configurations having more or less curvature or differing location of the centres of curvature may also be effective.

It can be seen that the rack or other support means in a stand according to the invention is generally curved toward the operator. This tends to incline shelves which are held on the  
20 lower part of the rack toward the operator and brings the slots or working surfaces within easier view and reach than a planar arrangement. It can also be seen that the shelves are preferably curved towards the operator with a common degree of curvature. This brings slots at each end of a shelf within easier view and reach, and enables several stands to be arranged side by side to form rows.

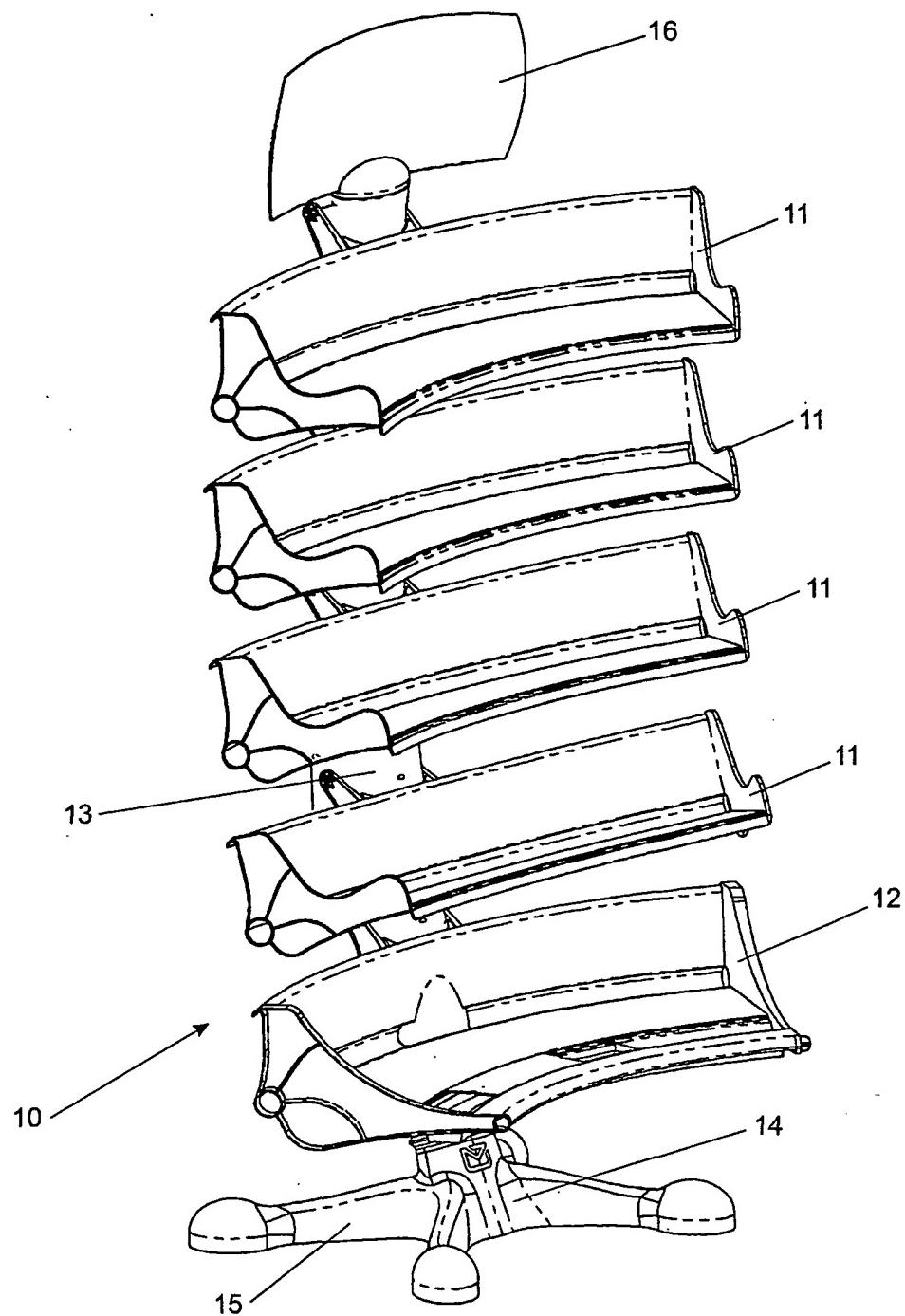
CLAIMS:

1. Apparatus for use in sorting articles, comprising:
  - an upright support having a base portion and a shelf holding portion,
  - 5 a plurality of shelves which are adjustable on the shelf holding portion to a range of heights above ground and which have a substantially horizontal curvature away from the shelf holding portion, and
  - a plurality of partitions which are adjustable on the shelves to provide a range of slots for sorted articles.
- 10 2. Apparatus according to claim 1 wherein the shelves are adapted to provide substantially uniform curves when placed in conjunction with shelves on adjacent apparatus.
- 15 3. Apparatus according to claim 1 wherein each shelf has front and back edges with substantially common curvature and end surfaces which are substantially perpendicular to the edges.
4. Apparatus according to claim 1 wherein each shelf has back, floor and end surfaces  
20 including one or more openings amongst the surfaces for removal of waste material from the articles.
5. Apparatus according to claim 1 wherein a lowermost shelf is enlarged to provide a work surface.
- 25 6. Apparatus according to claim 1 wherein the partitions are adjustable through a substantially continuous range of locations on the shelves.
7. Apparatus according to claim 6 wherein the partitions are adjustable by lifting up  
30 the partition, moving the partition to a desired position on a desired shelf and locking the partition to the desired position on the shelf.
8. Apparatus according to claim 1 wherein the partition includes a receptacle for a label which identifies a gap defined by the partition.

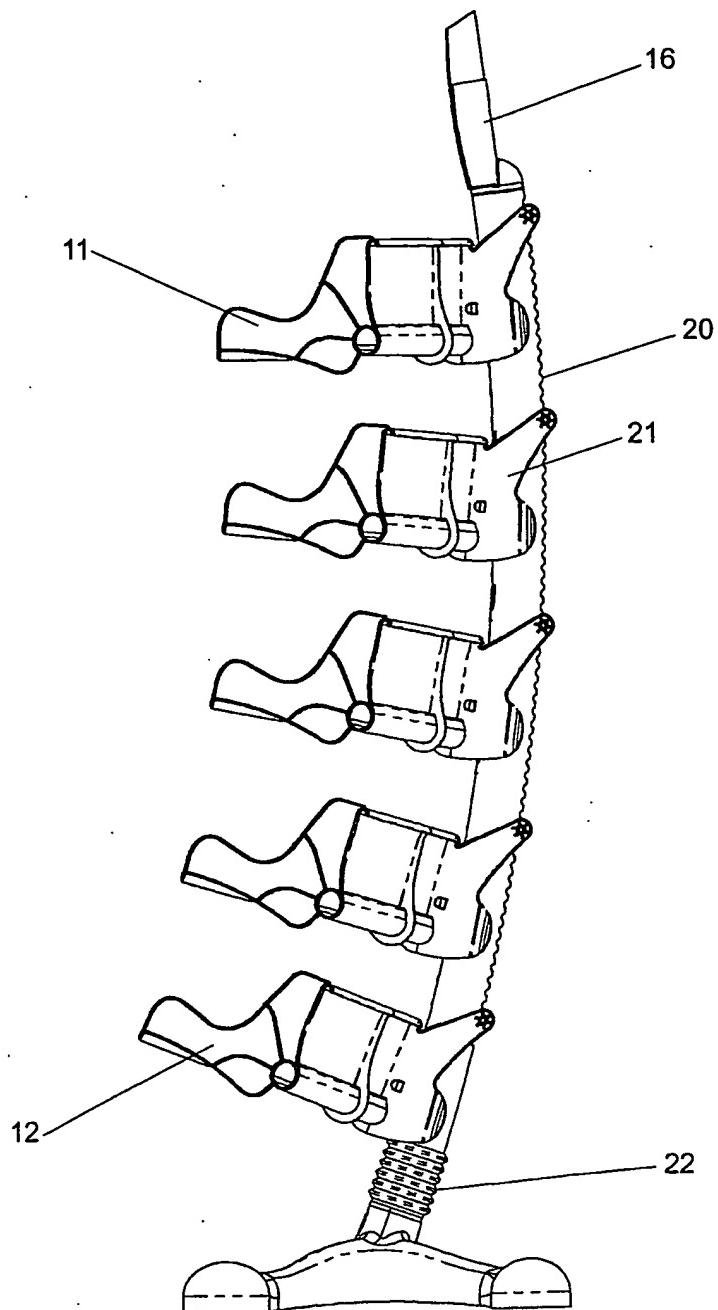
9. Apparatus according to claim 1 wherein the shelf holding portion of the support has a substantially vertical curvature.
10. Apparatus according to claim 1 wherein the shelves have a radius of curvature  
5 which is approximately three arms length of a user.
11. Apparatus for use in sorting articles, comprising:  
an upright support having a base portion and a shelf holding portion which has a substantially vertical curvature towards a potential user of the apparatus,  
10 a plurality of shelves which are adjustable on the shelf holding portion to a range of heights above ground, and  
a plurality of partitions which are adjustable on the shelves to provide a range of slots for sorted articles.
12. Apparatus according to claim 11 wherein the shelf holding portion of the support  
15 has a centre of curvature located behind the user.
13. Apparatus according to claim 11 wherein the shelf holding portion is adapted to orient each of the shelves toward the user.  
20
14. Apparatus according to claim 11 wherein the support is a column with a range of height locators which are adapted to engage brackets on the shelves.
15. Apparatus according to claim 11 wherein the support has an upper portion which  
25 is adapted to display information to the user.
16. Apparatus according to claim 11 wherein the partitions are adjustable by lifting up the partition, moving the partition to a desired position on a desired shelf and locking the partition to the desired position on the shelf.  
30
17. Apparatus according to claim 11 wherein the partition includes a receptacle for a label which identifies a gap defined by the partition.
18. Apparatus according to claim 11 wherein the shelves are curved in substantially  
35 horizontal directions towards the operator.

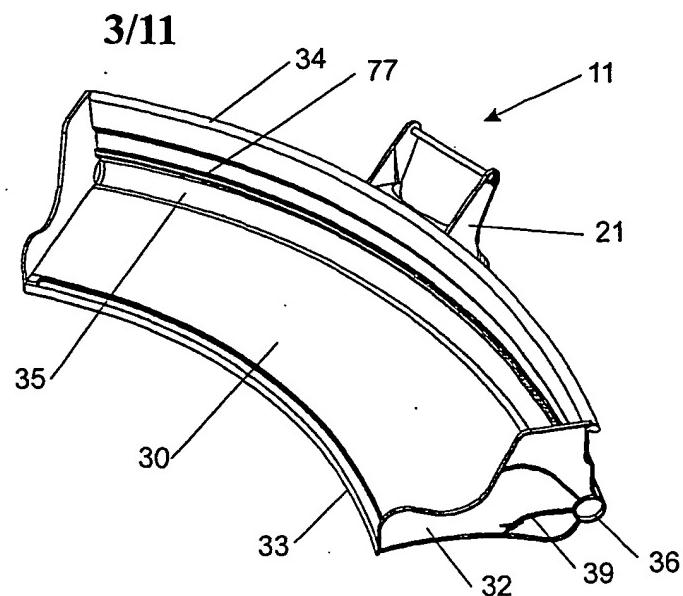
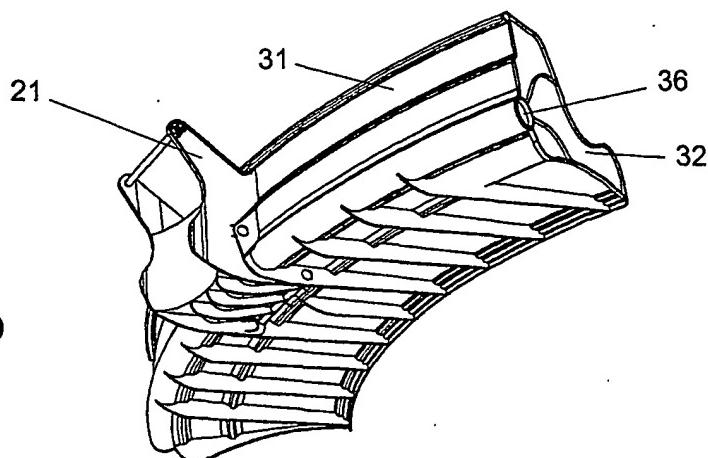
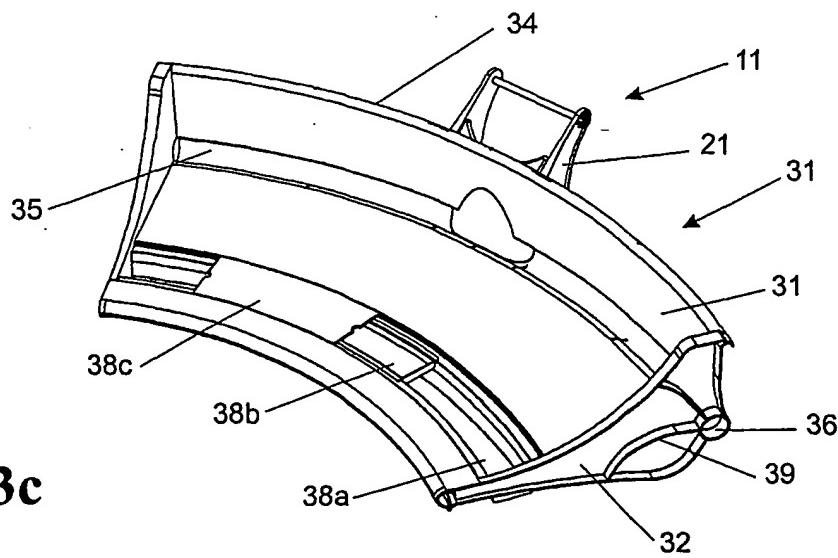
19. Apparatus for use in sorting articles, comprising:
  - an upright support having a base portion and a shelf holding portion which has a substantially vertical curvature towards a potential user of the apparatus,
  - a plurality of shelves which are adjustable on the shelf holding portion to a range of heights above ground and which have a substantially horizontal curvature away from the shelf holding portion, and
  - a plurality of partitions which are adjustable on the shelves to provide a range of slots for sorted articles.
- 10 20. Apparatus for sorting articles substantially as herein described with reference to the accompanying drawings.

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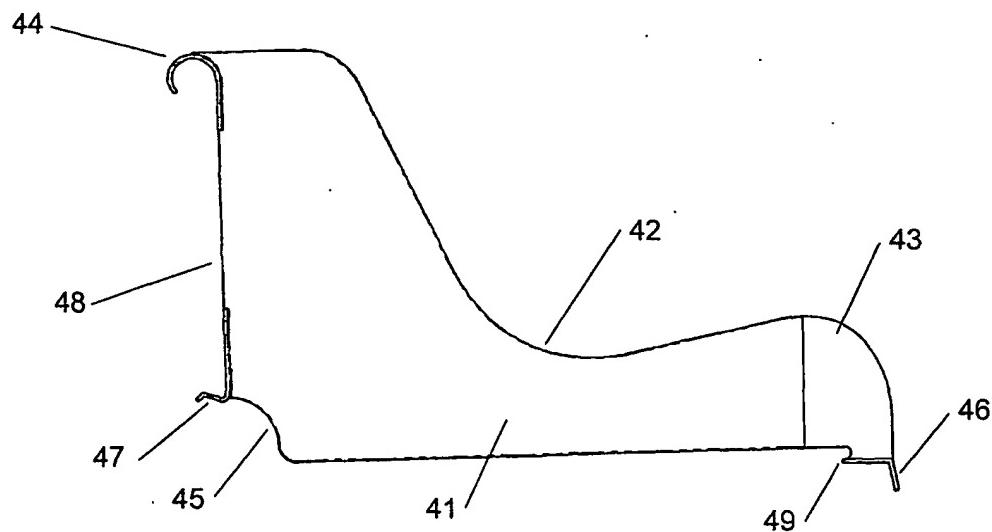
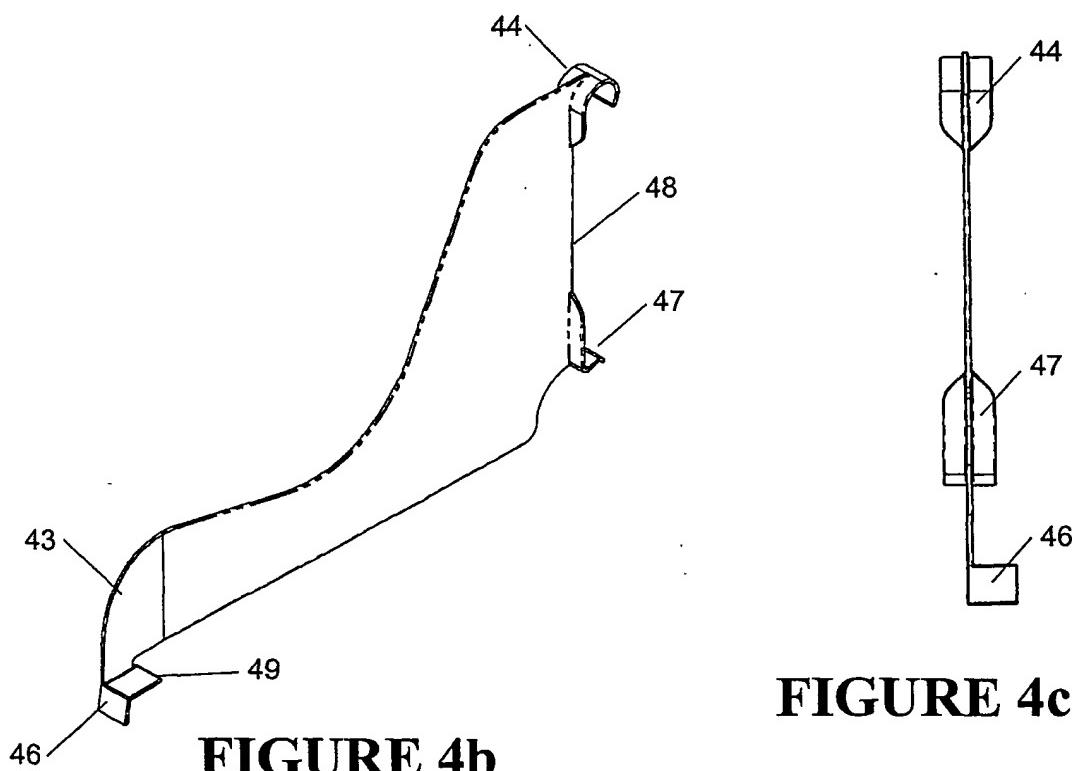
**FIGURE 1**

2/11

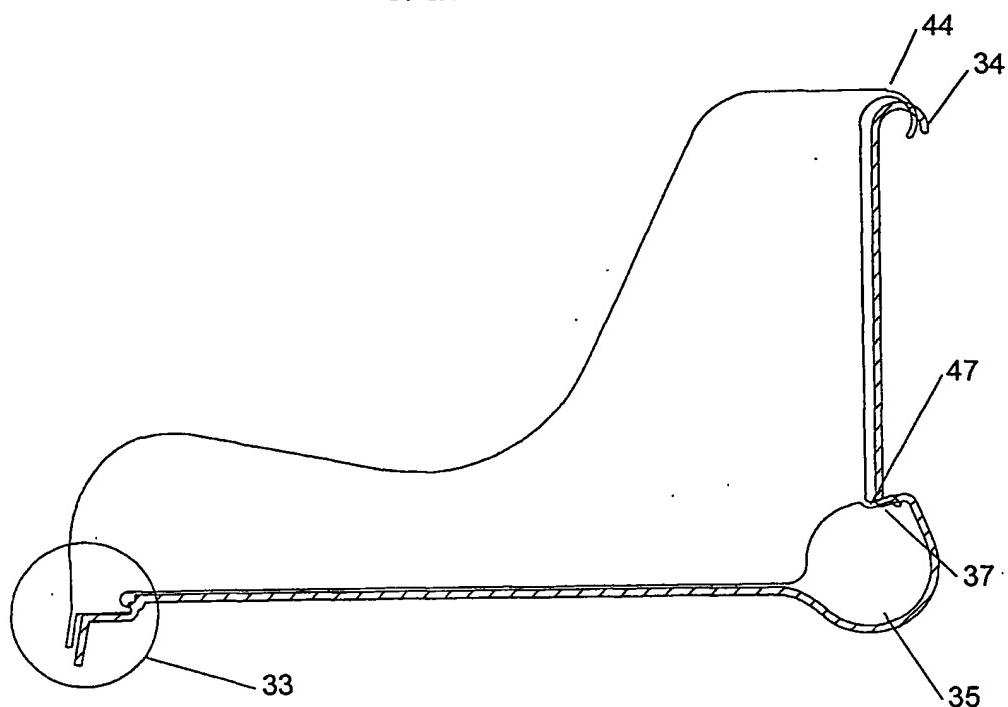
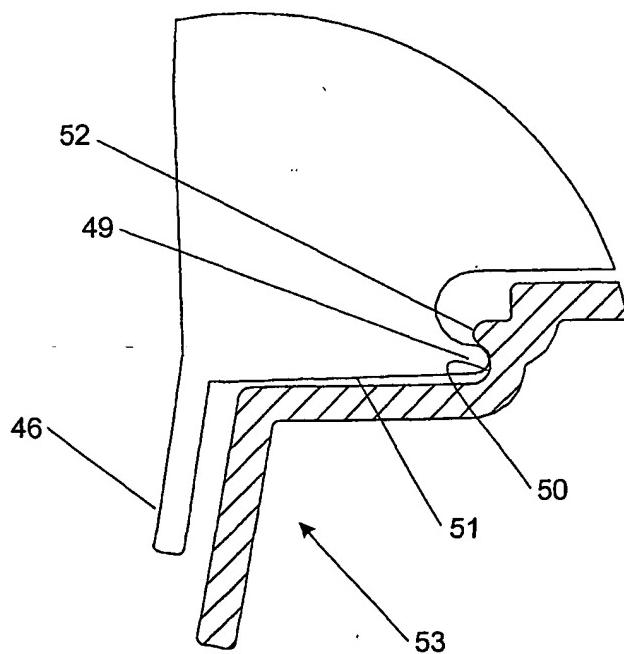
**FIGURE 2**

**FIGURE 3a****FIGURE 3b****FIGURE 3c**

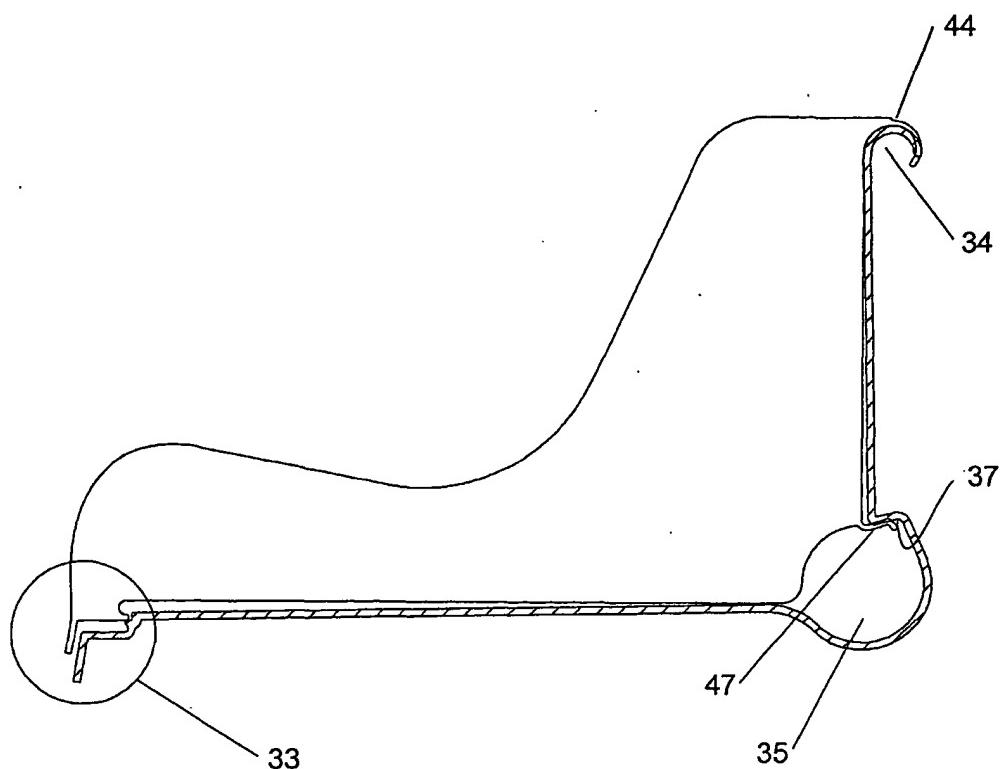
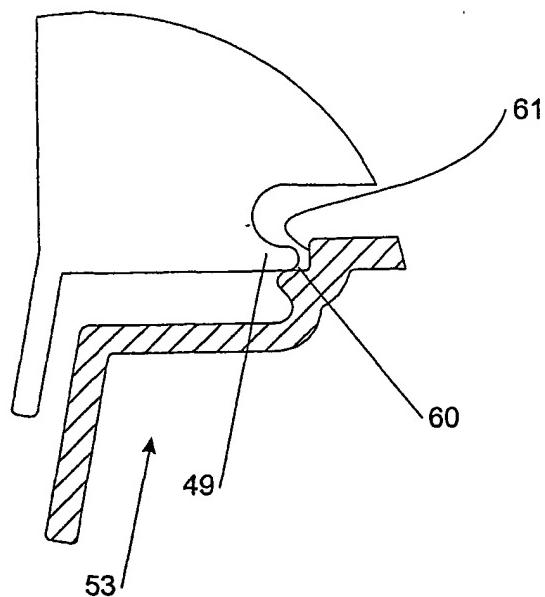
4/11

**FIGURE 4a****FIGURE 4b****FIGURE 4c**

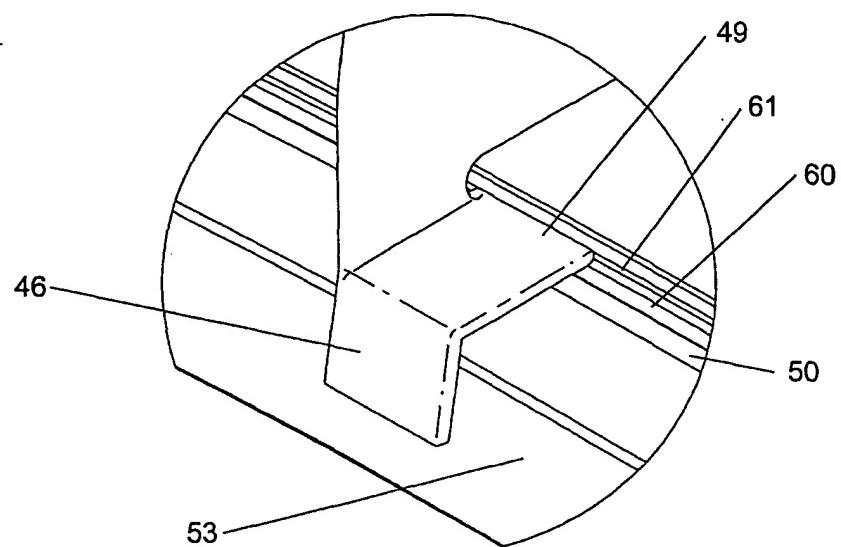
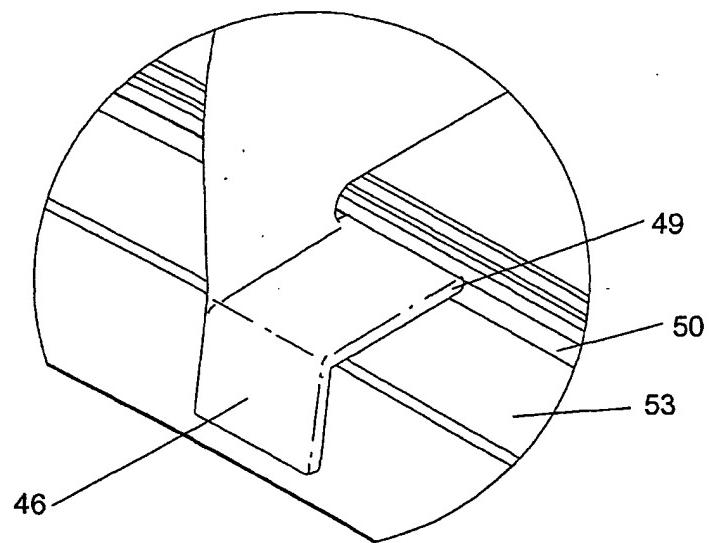
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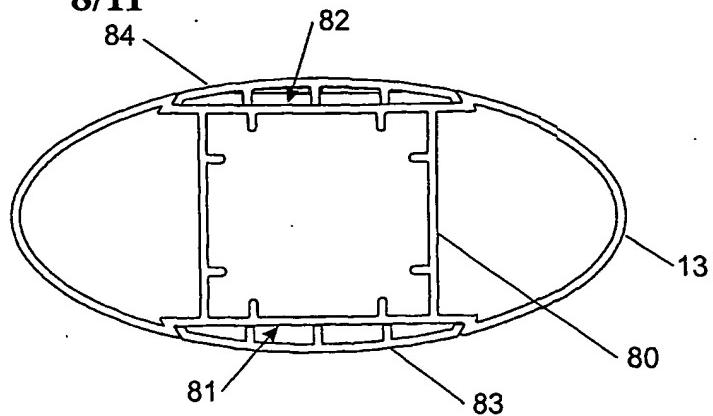
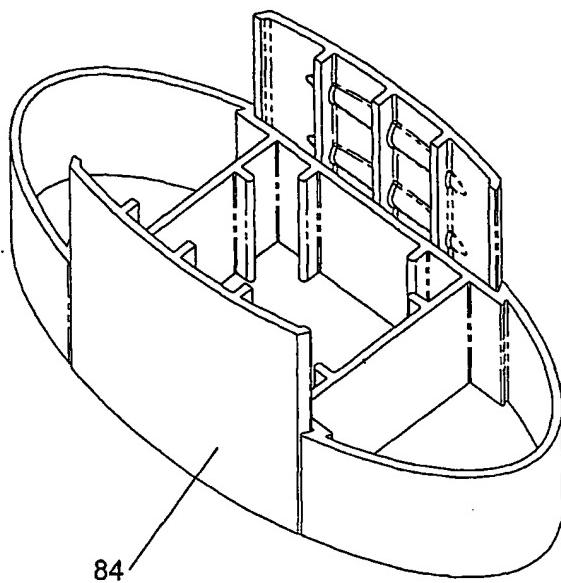
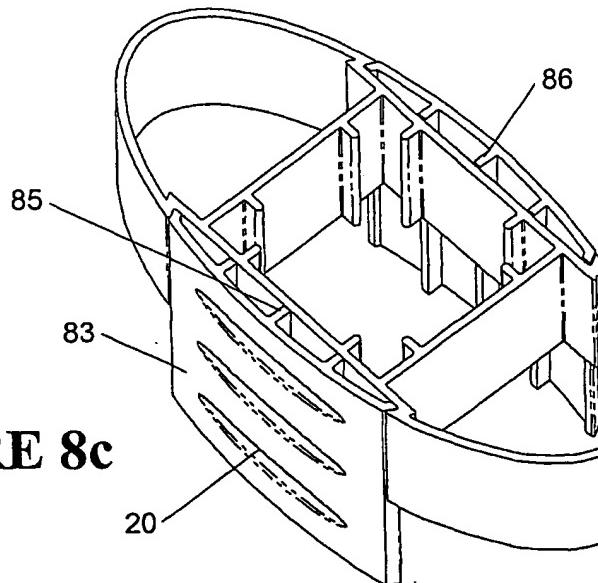
**FIGURE 5a****FIGURE 5b**

6/11

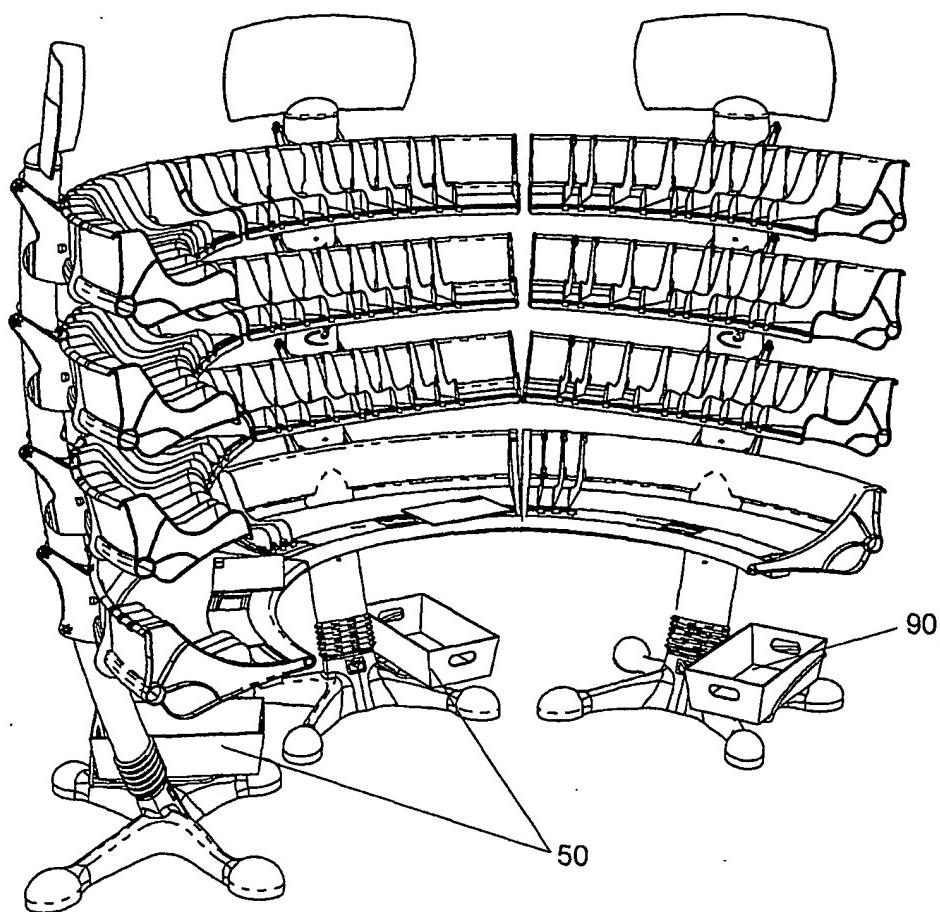
**FIGURE 6a****FIGURE 6b**

7/11

**FIGURE 7a****FIGURE 7b**

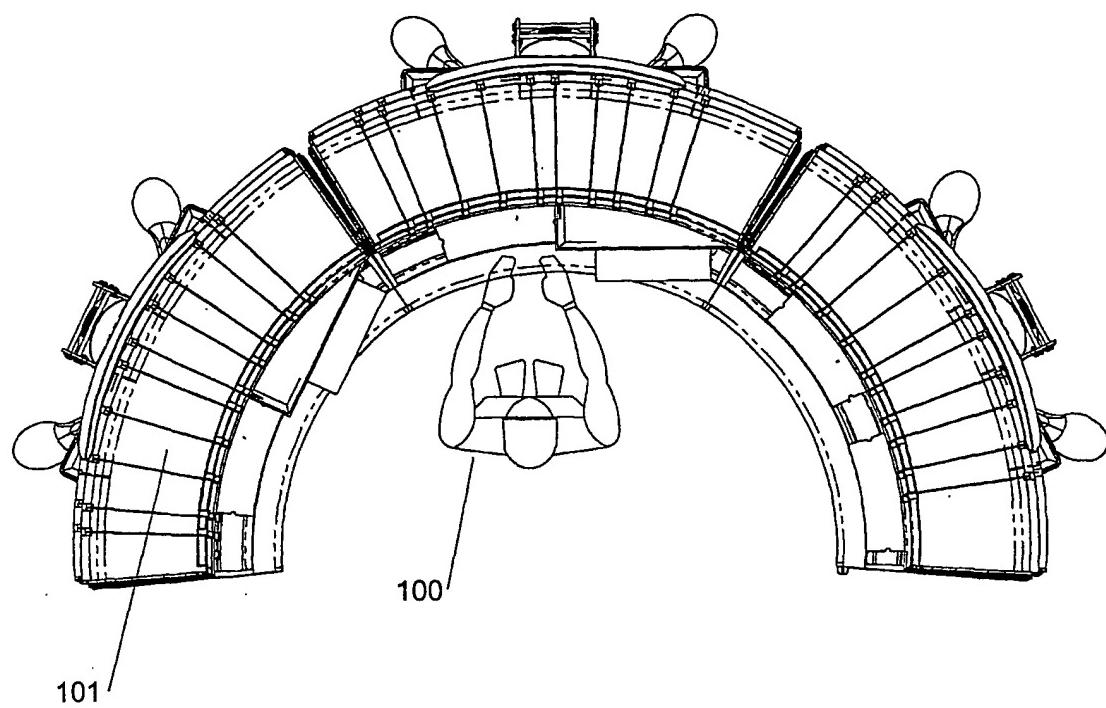
**8/11****FIGURE 8a****FIGURE 8b****FIGURE 8c**

**9/11**

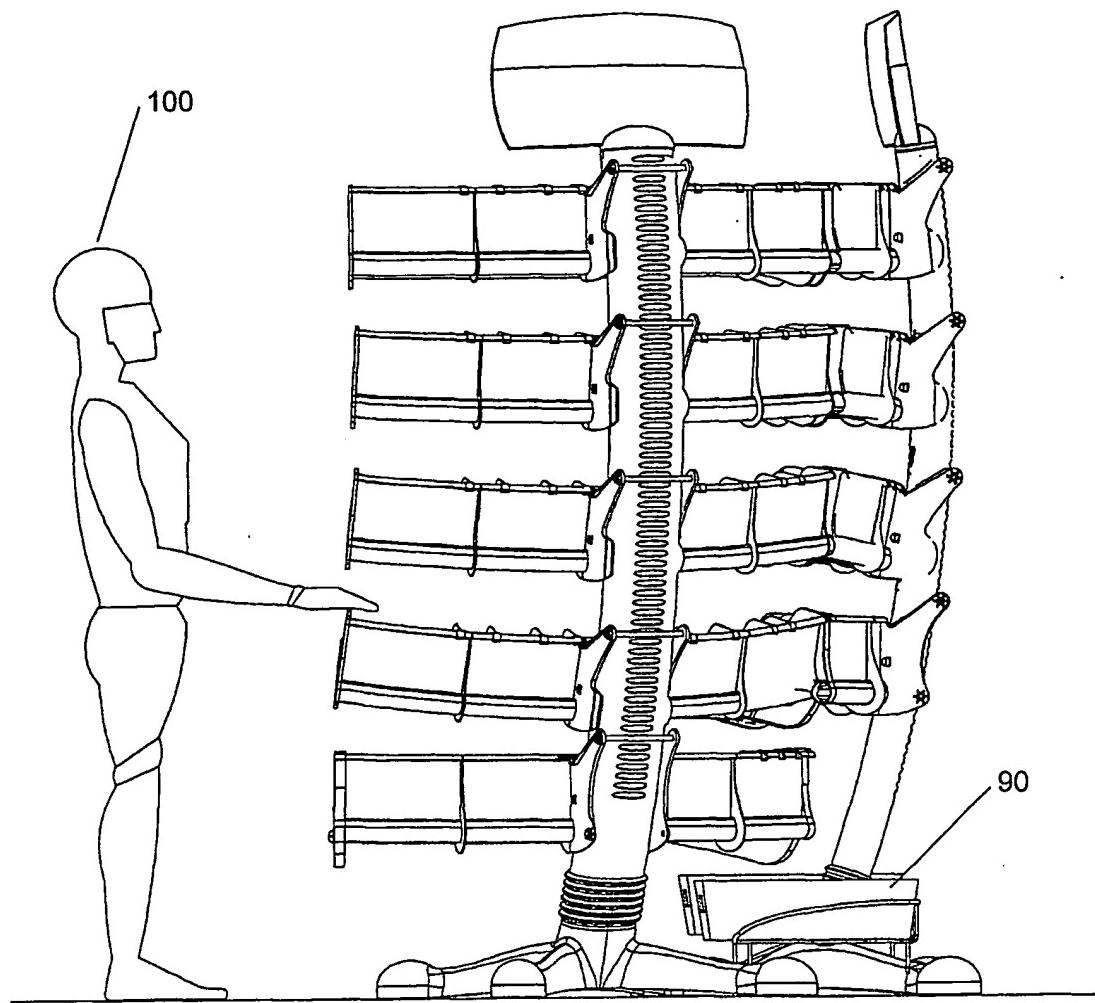


**FIGURE 9**

**10/11**



**FIGURE 10**

**11/11****FIGURE 11**

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/NZ01/00100

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>		
Int Cl <sup>7</sup> : B07C 7/02, 7/04, 3/02		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols) IPC B07C 7/IC, 3/00, 3/02, B23Q 7/12, A47B 45/00, 47/00		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched AU: IPC as above		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) DWPI and JAPIO with Keywords: Shelves, shelf, rack? tier +, deck?; curv +, curl +, circl +, arc +, circular +; slot, compartment or (pigeon hole?), pigeonhole?, cell?, cavit +.		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4254875 A (VARHELYI) 10 March 1981.	
A	FR 2357150 A (CITRON et al) 27 January 1978.	
A	DE 29815990 U (GUENTHER) 5 November 1998.	
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C		<input checked="" type="checkbox"/> See patent family annex
<p>* Special categories of cited documents:</p> <p>"A" Document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&amp;" document member of the same patent family</p>		
Date of the actual completion of the international search 03 August 2001	Date of mailing of the international search report <i>21 August 2001</i>	
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200 WODEN ACT 2606 AUSTRALIA E-mail address: <a href="mailto:pct@ipaaustralia.gov.au">pct@ipaaustralia.gov.au</a> Facsimile No.: (02) 6285 3929	Authorized officer <b>MICHAEL HALL</b> Telephone No.: (02) 6283 2190	

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 00/66284 A (SUOMEN POSTI OY) 9 November 2000.	

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.  
**PCT/NZ01/00100**

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member
US	4254875	NONE
FR	2357150	NONE
DE	29815990 U	NONE
WO	00/66284	NONE

END OF ANNEX